

**DATE:** November 16, 2022

**SUBJECT:** DRAFT Test Data for Sterilization Chamber Vents at Facilities in the Ethylene Oxide Commercial Sterilization Facilities Source Category - Proposal Review for Ethylene Oxide Commercial Sterilization Source Category  
EPA Contract No. 68HERD20A0004; Task Order 29

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## **I. Introduction**

Section 112 of the Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to establish technology-based standards for sources of hazardous air pollutants (HAP). These technology-based standards are often referred to as maximum achievable control technology (MACT) standards, which may be promulgated for major and area sources. For area sources, CAA section 112(d)(5) allows the EPA to set standards based on generally available control technology in lieu of MACT standards. The EPA established national emission standards for hazardous air pollutants (NESHAP) on December 6, 1994 (59 FR 62585) for the ethylene oxide (EtO) commercial sterilization source category as 40 CFR part 63, subpart O. Section 112(d)(6) contains provisions requiring the EPA to periodically review these standards. The EPA is conducting a rule review and considering emission standards for a number of currently unregulated emission sources under CAA sections 112(d)(2)-(3) or (d)(5). The EPA is also completing a residual risk review under CAA section 112(f)(2) and a technology review of current emission standards under CAA section 112(d)(6).

The current subpart O NESHAP applies to sources that use at least 1 ton of EtO in sterilization or fumigation operations in each consecutive 12-month period. Emission releases from the EtO commercial sterilization facilities include sterilizer chamber vents (SCV), aeration room vents (ARV), chamber exhaust vents (CEV), and room air emission sources. While there are current emission standards for some SCV and ARV emission sources, there are additional emission sources that are not subject to emission standards. Under the rule review, the EPA is completing a review of currently unregulated emission sources.

The purpose of this memorandum is to present the available performance and emission test data for SCV in the source category. These test data may be used in standards setting under CAA sections 112(d)(2)-(3) or (d)(5) for SCV emissions. These test data may also be used to inform CAA section 112(d)(6) technology reviews and section 112(f)(2) residual risk reviews for SCV emissions.

## **II. Sources of Performance and Emission Test Data**

Under the rule review for the EtO commercial sterilization facilities source category, EPA discussed with EPA regional offices and state and local agencies the available information for facilities in the source category. The main sources of emission test data are those provided by EPA Regions and state and local agencies and are from responses to the CAA section 114 requests sent to industry. The December 2019 CAA section 114 request was issued to a few select companies to gather information, and the September 2021 information collection request, under CAA section 114, was issued to gather information from all facilities in the EtO commercial sterilization category. (RTI 2022)

In the December 2019 and September 2021 requests, the EPA sent questionnaires to EtO commercial sterilization companies. The questionnaires were designed in the form of a Microsoft Excel® file, with the intention to collect information about sterilization chambers, CEVs, aeration rooms, EtO storage, and room air emission sources. Although the questionnaires did not require any new testing to be performed, the “APCD Summary” worksheet in the questionnaire requested all emission tests conducted in the last five years and asked each facility to submit complete copies of the test reports. In addition, EPA Regions and state and local agencies provided emission test data for facilities located in their area. The collection of test reports contained emission results for EtO from sterilization chambers, CEVs, aeration rooms, and room air emissions. The data compiled for this analysis for SCVs is from the most recent test available for each facility. Copies of the SCV performance and emission test reports collected are included in Docket ID No. EPA-HQ-OAR-2019-0178.

Some performance and emission tests include data from testing that was conducted solely while one type of emission source was venting (e.g., only for SCV), while other tests include data where more than one emission source type was venting during testing (e.g., both SCV and ARV were venting simultaneously during the testing). The test data that reflect the emissions from one emission source type are summarized. The available performance and emission tests for combined streams where more than one emission source type was venting during the test, or where we could not determine whether only one emission source type was vented during the test, are provided separately.

The EPA reviewed the available data and information for SCV for the following point sources:

- SCV at facilities where EtO use is at least 40 tpy,
- SCV at facilities where EtO use is at least 10 but less than 40 tpy,
- SCV at facilities where EtO use is at least 1 but less than 10 tpy,
- SCV at facilities where EtO use is less than 1 tpy.

A. SCV at facilities where EtO use is at least 40 tpy.

There are a total of 36 facilities where EtO use is at least 40 tpy. All 36 facilities have SCV emission sources and have APCDs in place. See **Appendix A, Table A.1** for the full list of facilities where EtO use is at least 40 tpy and have SCVs. There are 26 facilities that have available SCV emission test data. Some of these tests included combined streams for multiple emission source types. There are 22 facilities with emission test measurements available solely for SCVs, and these data are provided in **Appendix A, Table A.2**. There are another 4 facilities that conducted testing of combined source types (e.g., SCV and ARV); these data are provided in **Appendix A, Table A.3**.

B. SCV at facilities where EtO use is at least 10 but less than 40 tpy.

There are a total of 11 facilities where EtO use is at least 10 but less than 40 tpy. All 11 facilities have SCV emission sources and have APCDs in place. See **Appendix B, Table B.1** for the full list of facilities where EtO use is at least 10 but less than 40 tpy and have SCVs. There are 8 facilities that have available SCV emission test data. Some of these tests included combined streams for multiple emission source types. There are 6 facilities with emission test measurements available solely for SCVs, and these data are provided in **Appendix B, Table B.2**. There are other facilities that conducted testing for multiple combined sources (e.g., SCV and ARV); these data are provided in **Appendix B, Table B.3**.

C. SCV at facilities where EtO use is at least 1 but less than 10 tpy.

There are a total of 18 facilities where EtO use is at least 1 but less than 10 tpy, and all 18 facilities have SCV emission sources and have APCDs in place. See **Appendix C, Table C.1** for the full list of facilities. There are 9 facilities that have available SCV emission test data. Some of these tests included combined streams for multiple emission source types. There are 8 facilities with emission test measurements available solely for SCVs, and these data are provided in **Appendix C, Table C.2**. There are other facilities that conducted testing for multiple combined sources (e.g., SCV and ARV); these facilities are provided in **Appendix C, Table C.3**.

D. SCV at facilities where EtO use is less than 1 tpy.

There are a total of 20 facilities where EtO use is less than 1 tpy. All 20 facilities have SCV emission sources, 19 facilities have APCDs in place for SCVs, and 1 has an uncontrolled SCV. See **Appendix D, Table D.1** for the full list of 20 facilities where EtO use is less than 1 tpy and that have SCVs. (Another 12 facilities that are believed to conduct EtO sterilization for research and development purposes and are not included as part of the source category are also provided in **Table D.1** for informational purposes.) Of the 19 facilities with APCDs, there are 2 that have available SCV emission test data, both of which have emission test measurements available solely for SCVs, and these data are provided in **Appendix D, Table D.2**. There are no test data available for the facility with an uncontrolled SCV. (Of the other 12 facilities that have not been included in the EtO commercial sterilization facilities source category, 2 of the facilities have available test data; the data for these facilities are provided in **Appendix D, Table D.3**.)

### **III. Data Compiled and Calculations Conducted from Test Reports**

From each emission test report, the following inlet and outlet parameters and emissions data for each test run as available were compiled into a master run-by-run spreadsheet:

- Emission source and air pollution control device type
- Flow rate, in actual cubic feet per minute (acfm)
- Flow rate, in dry standard cubic feet per minute (dscfm)
- Sample volume, in dry standard cubic feet (dscf)
- Sample volume, in dry standard cubic meter (dscm)
- Stack moisture, in percent (%)
- Stack gas temperature, in degrees Fahrenheit (°F)
- Oxygen content of stack gas, in percent (%)
- Pollutant concentration, in parts per million volume (ppmv)
- Pollutant emission rate, in pounds per hour (lb/hr)
- Destruction and Removal Efficiency (DRE), in percent (%)

Once the data were compiled, the following calculations were conducted in the master run-by-run spreadsheet if the data were not provided in the test report:

- Converted reported concentrations to micrograms per dry standard cubic meter ( $\mu\text{g}/\text{dscm}$ )
- Calculated concentrations on dry basis if values were reported as wet and moisture was provided

As part of the test data review, the stack moisture collected for each test run was evaluated. Several emission test reports did not provide stack moisture and/or did not clarify whether the EtO concentration results were on a wet or dry basis. If test data are provided without moisture data or clarity, the default moisture content of 2 percent (%) was assumed and, the outlet EtO concentration was adjusted to ppmv dry (ppmvd).

### **IV. Quality Assurance/Quality Control Checks**

After the test data had been compiled and calculated in the master run-by-run spreadsheet, there were internal QA/QC reviews from RTI and the EPA. There was a review of what specific emission sources were included during the emission test, and there was a review of the reported detection limit. Test data determined to be unacceptable or not appropriate after the QA/QC checks were removed from the run-by-run spreadsheet and were not included in the SCV emission standards analysis. Appendix A shows the analysis for SCV at facilities where EtO use is at least 40 tpy, and Appendix B includes the analysis for SCV at facilities where EtO use is at least 10 but less than 40 tpy. Appendix C shows the analysis for SCV at facilities where EtO use is at least 1 but less than 10 tpy, and Appendix D includes the analysis for SCV at facilities where EtO use is less than 1 tpy. The first table of each appendix shows all facilities with the emission source type within the subcategory. The second table in each appendix contains the run-by-run test data that were available in the analysis with measurements solely for SCV emissions. The third table in each appendix includes the list of test data that were removed from the run-by-run spreadsheet following the QA/QC reviews, e.g., because the measurements during the test were conducted when multiple emission source types were venting simultaneously.

#### A. Multiple Emission Sources

At some facilities, multiple emissions source types were operating simultaneously and ducted together to one or more outlet stacks being tested. Where the SCVs were tested separately, this is annotated as such in the run-by-run spreadsheets. At some facilities, multiple emission source types (sterilization chambers, aeration room vents, CEVs, and room air emission sources) were routed together to one APCD during the emission test. These test runs were not included in the data set for setting SCV emission standards as SCV-specific data were not available. See appendix Tables A.3, B.3, C.3, and D.3 for the list of test runs not included.

#### B. Non-Detects

The detection limit varied based on the test method and analytical equipment used by the testing firm. For individual test runs that had values flagged as being below detection limit (BDL), then the method detection limit (MDL) or other reporting limit if an MDL was not available was used as the concentration for that test run. The concentration, emission rate, and emission factor were then calculated for each test run, as appropriate.

If all the test data for a run were flagged as BDL, then the emission test data was considered BDL. If there was a mix of test data flagged as BDL and above detection limit (ADL), then the emission test data were considered detection level limited. If all test data for a run were flagged as ADL, then the run was considered ADL. (Westlin and Merrill 2011)

Some test reports that use EPA Reference Method 18 (M18) or CARB Method 431 (CARB 431) reported MDL considerably lower than the generally accepted MDL for the test method. For M18 and CARB 431, 0.2 ppmv is the Representative Detection Level (RDL). Test run data provided in the test reports of 0.15 ppmv or more are considered to be reasonable. For any test run values that are less than 0.15 ppmv, however, the 0.2 ppmv RDL was used to calculate the concentration and emission rate for that run. Some available test reports used either EPA Reference Method 320 or TO-15 (modified) to analyze for EtO with sufficiently low detection limits. As such, no adjustment to the MDL was necessary for these data.

#### C. Anomalous Data

One test report indicated that the data for a single test run was determined to be anomalous by the facility and responsible permitting authority. The data were excluded from consideration and listed in Appendix C.3.

### V. References

RTI 2022. *Documentation of Database Containing Information from Responses to the December 2019 Questionnaire and the September 2021 Section 114 for the Ethylene Oxide Commercial Sterilization NESHAP Review*. Memorandum from R. Vanek, RTI International. November 2022.

Westlin, P., and R. Merrill. 2011. *Data and procedure for handling below detection level data in analyzing various pollutant emissions databases for MACT and RTR emissions limits*.

Memorandum from Peter Westlin, SPPD/MPG and Raymond Merrill, AQAD/MTG, to SPPD management and MACT rule writers. December 13, 2011 (Revised April 5, 2012).

### **Test Report References for Appendices**

Abbott 2016. *Results of Annual Ethylene Oxide Source Testing and Leak Testing*, for Abbott Vascular Facility in Temecula, California. Performance testing for SCV and ARV on April 7, 2016. Test Report summary memo and tables dated April 2016.

Abbott 2017. *Results of Annual Ethylene Oxide Source Testing and Leak Testing*, for Abbott Vascular Facility in Temecula, California. Performance testing for SCV and ARV on May 23, 2017. Test Report summary memo and tables dated May 2017.

Abbott 2018. *Results of Annual Ethylene Oxide Source Testing and Leak Testing*, for Abbott Vascular Facility in Temecula, California. Performance testing for SCV and ARV on May 17, 2018. Test Report summary memo and tables dated May 2018.

Abbott 2019. *Results of Annual Ethylene Oxide Source Testing and Leak Testing*, for Abbott Vascular Facility in Temecula, California. Performance testing for SCV on May 29, 2019. Test Report summary memo and tables dated May 2019.

Abbott 2020. *Results of Annual Ethylene Oxide Source Testing and Leak Testing*, for Abbott Vascular Facility in Temecula, California. Performance testing for SCV and ARV on May 21, 2020. Test Report summary memo and tables dated May 2020.

ACS 2013. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission-Control System*, for American Contract Systems Facility in Houston, Texas. Performance testing for SCV on June 24, 2013. Test Report dated July 2013.

Alcon 2019. Data tables from *WVDEP DAQ Permit to Modify R13-2820D Compliance Test Report*, for Covidien Facility in Lesage, West Virginia. Performance testing for SCV and ARV on April 24, 2019. Test Report summary tables dated June 2019.

Arthrex 2018. *Ethylene Oxide Sterilization MACT Emissions Testing*, for Arthrex Manufacturing in Ave Maria, Florida. Performance testing for SCV and ARV on December 12, 2017. Test report dated January 2018.

Auris Health 2014. Source Test Report Summary, for Auris Health Facility in San Jose, California. Performance testing for SCV on August 1, 2014. Test Report summary memo dated October 2014.

Auris Health 2015. Source Test Report Summary, for Auris Health Facility in San Jose, California. Performance testing for SCV on July 10, 2015. Test Report summary memo dated July 2015.

Baxter Healthcare 2021. Source Test Report Summary for Baxter Healthcare Facility in Mountain Home, Arkansas. Performance testing for SCV on February 25-26, 2020. Test Report Summary dated August 2021.

- B. Braun Medical 2021. *40 CFR 63 Subpart O PADEP Plan Approval Compliance Emissions Test Report*, for B. Braun Medical in Allentown, Pennsylvania. Performance testing for SCV and ARV on December 15, 2020. Test report dated February 2021.
- BD 2017. *Source Emissions Testing Report* for Becton Dickinson Facility in Sandy, Utah. Performance testing for SCV and ARV on August 2, 2017. Test report dated October 2017.
- BD 2018. Source Test Report Summary for Becton Dickinson Facility in Madison, Georgia. Performance testing for SCV and ARV on January 25-26, 2018. Test report summary dated March 2018.
- BD 2019. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission-Control System* for Becton Dickinson Facility in Covington, Georgia. Performance testing for SCV and ARV on September 11-12, 2019. Test report dated October 2019.
- BD 2020. *Source Test Report* for Becton Dickinson Facility in Columbus, Nebraska. Performance testing for SCV on July 8, 2020. Test report dated July 2020.
- Blue Line 2017. *Results of Ethylene Oxide Source Testing and Leak Testing*, for Blue Line Sterilization Services Facility in Novato, California. Performance testing for SCV on August 28 and October 10, 2017. Test Report summary dated October 2017.
- Blue Line 2018. *Results of Ethylene Oxide Source Testing and Leak Testing*, for Blue Line Sterilization Services Facility in Novato, California. Performance testing for SCV on October 23, 2018. Test Report summary dated October 2018.
- Blue Line 2019. *Results of Ethylene Oxide Source Testing and Leak Testing*, for Blue Line Sterilization Services Facility in Novato, California. Performance testing for SCV on August 28, 2019. Test Report summary dated August 2019.
- Blue Line 2021. *Results of Ethylene Oxide Source Testing*, for Blue Line Sterilization Services Facility in Novato, California. Performance testing for SCV on October 27, 2021. Test Report summary dated October 2021.
- Boston Scientific 2019. *Compliance Test Report 2019 Lesni Efficiency Test*, for Boston Scientific/Guidant Puerto Rico Facility in Dorado, Puerto Rico. Performance testing for SCV on June 13-14, 2019. Test Report dated July 2019.
- Boston Scientific 2019-5. Source Test Summary Memo, for Boston Scientific/Cardiac Pacemakers Facility (Bldg 5) in Arden Hills, Minnesota. Performance testing for SCV on September 20, 2019. Test Report dated October 2019.
- Boston Scientific 2019-9. Source Test Summary Memo, for Boston Scientific/Cardiac Pacemakers Facility (Bldg 9) in Arden Hills, Minnesota. Performance testing for SCV on May 31, 2019. Test Report dated June 2019.

Boston Scientific 2020-C. Source Test Summary Memo, for Boston Scientific/Cardiac Pacemakers Facility (Bldg C) in Arden Hills, Minnesota. Performance testing for SCV on September 5, 2020. Test Report dated September 2020.

Boston Scientific 2020-5. Source Test Summary Memo, for Boston Scientific/Cardiac Pacemakers Facility (Bldg 5) in Arden Hills, Minnesota. Performance testing for SCV on November 30, 2020. Test Report dated December 2020.

Boston Scientific 2020-9. Source Test Summary Memo, for Boston Scientific/Cardiac Pacemakers Facility (Bldg 9) in Arden Hills, Minnesota. Performance testing for SCV on June 23, 2020. Test Report dated July 2020.

Cook 2020. *Compliance Test Report*, for Cook Facility in Ellettsville, Indiana. Separate performance testing for SCV, ARV, and CEV on February 6-7, 2020. Test report dated March 2020.

Cosmed 2004. *Stack Test Report Ethylene Oxide Emissions Test*, for NASP (Cosmed Group) in Franklin, New Jersey. Performance testing for SCV and ARV on August 17-18, 2004. Test report summary memo dated September 2004.

Cosmed 2000. Ethylene Oxide Emissions Summary, for Cosmed Group in Linden, New Jersey. Performance testing for SCV on May 26-27, 1999 and June 2, 1999. Test report summary memo dated January 2000.

Covidien 2021. *2020 Annual Catalytic Oxidizer Performance Test* for Covidien Facility in North Haven, Connecticut. Performance testing for SCV and ARV on December 14, 2020. Test Report dated January 2021.

Edwards Lifesciences 2022. *Testing Report on Air Quality Control System for Ethylene Oxide* for Edwards Lifesciences Facility in Añasco, Puerto Rico. Performance testing for SCV, ARV, and CEV on July 28-30, 2022. Test report dated September 2022.

Elite Spice 2016. *Emission Compliance Test Report to Determine Ethylene Oxide Emissions Associated with the Ethylene Oxide Scrubber System*, for Elite Spice Facility in Hanover, Maryland. Performance testing for SCV on December 18, 2015. Test report dated January 2016.

Elite Spice 2019. *ETO Reno Scrubber Efficiency Calcs*, for Elite Spice Facility in Sparks, Nevada. CEMS data for SCV on November 22, 2019. CEMS summary tables dated November 2019.

Ethicon 2003. *Source Test Report: Emissions Testing of the East and West ETO Abators and East and West Fluid Bed Scrubbers*, for Ethicon, Inc. in San Angelo, Texas. Performance testing for SCV and ARV on September 15-17, 2003. Test report dated November 2003.

ISL 2006. *Source Test Report for Ethylene Oxide Emissions*, for International Sterilization Laboratory Facility in Groveland, Florida. Performance testing for SCV and ARV on June 7, 2006. Test report dated June 2006.



KPR 2020. Source Test Report Review, for Kendall Patient Recovery U.S. in Augusta, Georgia. Performance testing for SCV on March 11-13, 2020. Georgia EPD. Agency report review dated April 2020.

Lemco 2002. *Survey of Source Emissions*, for Lemco Enterprises Facility in Ardmore, Oklahoma. Performance testing for SCV on October 25, 2001. Test report dated January 2002.

LifeNet Health 2019. *Compliance Test Report Determination of Ethylene Oxide Removal Efficiency* for LifeNet Health Facility in Virginia Beach, Virginia. Performance testing for SCV on February 6, 2019. Test Report dated February 2019.

Long Island Sterilization 2019. *Test Report for an Ethylene Oxide Compliance Test at Two Sterilizers and Associated Wet Scrubber* for Long Island Sterilization Facility in Hauppauge, New York. Performance testing for SCV on July 11, 2019. Test Report dated September 2019.

Medline 2020. *Test Report Compliance Emission Test* for Medline Industries Facility in Waukegan, Illinois. Performance testing for SCV, ARV, CEV, and Fugitive emissions on March 10-12, 2020. Test Report dated March 2020.

Medtronic Xomed 2012. *Test Report Air Pollution Source Testing Ethylene Oxide Emission Control Device* for Medtronic Xomed Facility in Jacksonville, Florida. Performance testing for SCV on October 2-4, 2012. Test Report dated November 2012.

Medtronic 2000. *Initial Performance Test and Oxidation Temperature Continuous Monitoring System Performance Evaluation Test* for Medtronic Facility in Villalba, Puerto Rico. Performance testing for SCV on July 31, 2000. Test Report summary dated October 2000.

Midwest 2019. *Final Test Reporting 2019 CD-01 and CD-03 Test for Destruction Removal Efficiency of Ethylene Oxide Emissions from Sterilization Chamber Vents and Sterilization Chamber Back Vents* for Midwest Sterilization Facility in Jackson, Missouri. Performance testing for SCV and CEV on October 3-4, 2019. Test Report dated October 2019.

Midwest 2022. *Compliance Test Report 2021 Texas Commission on Environmental Quality Compliance Test of Clean Air Group/Croll Reynolds Acid Gas Scrubber for the Emissions Control of Sterilization Chamber Vents and Sterilization Chamber Back Exhaust Vents* for Midwest Sterilization Facility in Laredo, Texas. Performance testing for SCV and CEV on December 15-17, 2021. Test Report dated January 2022.

Parter 2006. *Results of Ethylene Oxide Source Testing* for Parter Sterilization Services Facility in Carson, California. Performance testing for SCV, ARV, and CEV on October 3, 2006. Test Report summary dated October 2006.

Professional Contract Sterilization 2021. *Report of a Pollution Control System Test DAMAS frit tube acid scrubber to Control Chamber Vent EtO Emissions*, for Professional Contract Sterilization in Taunton, Massachusetts. Performance testing for SCV on May 7, 2011. Test report summary dated June 2011 are on pages 26-28 of 20210623\_PCSMA\_Correspondence

SSGA 2021. *Report on Ethylene Oxide Testing*, for Sterilization Services of Georgia in Atlanta, Georgia. Performance testing for SCV, ARV, CEV, and Fugitive emissions on February 23-25, 2021. Georgia EPD. Test report dated April 2021.

Sterigenics 2003. Stack Test Report for Sterigenics Facility in Grand Prairie, Texas. Performance testing for SCV on December 16, 2003. Test Report dated December 2003.

Sterigenics 2012. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission-Control System* for Sterigenics Facility in Los Angeles, California. Performance testing for SCV on October 26-27, 2011. Test Report dated February 2012.

Sterigenics 2013. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission-Control System* for Sterigenics Facility in Santa Teresa, New Mexico. Performance testing for SCV on December 12, 2012. Test Report dated January 2013.

Sterigenics 2016. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission-Control System* for Sterigenics Facility in Salt Lake City, Utah. Performance testing for SCV on April 19, 2016. Test report dated May 2016.

Sterigenics 2017. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission Control System* for Sterigenics Facility in Queensbury, New York. Performance testing for SCV on October 23, 2017. Test report dated December 2017.

Sterigenics 2020. *Report on Ethylene Oxide Testing Atlanta Facility*, for Sterigenics Facility in Smyrna, Georgia. Separate performance testing for SCV, ARV, CEV, and Fugitives on June 24-26, 2020. Test report dated July 2020.

STERIS 2003. Stack Test Report Review, for Cosmed of New Jersey (STERIS Isomedix) in South Plainfield, New Jersey. Performance testing for SCV and ARV on February 13, 2003. NJDEP. Test report summary memo dated July 2003.

STERIS 2006. *Stack Test Report Ethylene Oxide Emissions Test*, for Isomedix Operations in Northborough, Massachusetts. Performance testing for SCV and ARV on August 1, 2006. Test report dated September 2006.

STERIS 2011. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission Control System*, for STERIS Grand Prairie in Grand Prairie, Texas. Performance testing for SCV on August 18, 2011. Test Report dated September 2011.

STERIS 2018. *Report of Air Pollution Source Testing of an Ethylene Oxide Emission Control System* for STERIS Isomedix Facility in Coon Rapids, Minnesota. Performance testing for SCV, ARV, CEV, and Fugitive exhaust hood combined on September 6, 2018. Test Report dated October 2018.

STERIS 2018. APCD2018-NOV-000529 for STERIS Facility in San Diego, California. Agency NOV provides DRE, on March 27, 2018. NOV summary dated June 2018.

STERIS 2020. *Results of the Annual Ethylene Oxide Source Testing* for STERIS Isomedix Facility in Temecula, California. Performance testing for SCV and ARV on February 20, 2020. Test Report summary dated February 2020.

Steri-Tech 2000. *Performance Source Testing Report Ethylene Oxide Control Efficiency Determination*, for Steri-Tech in Salinas, Puerto Rico. Performance testing for SCV and ARV on November 30 - December 2, 1999. Test report summary memo dated January 2000.

St. Jude 2011. *Certification Performance Test* for St. Jude Medical Facility in Arecibo, Puerto Rico. Performance testing for SCV on July 28-30, 2010; memo provides DRE. Certification memo dated January 2011.

Stryker Sustainability Solutions 2020. *Compliance Test Report*, for Stryker Sustainability Solutions Facility in Phoenix, Arizona. Performance testing for SCV on January 7, 2020. Test Report dated February 2020.

**Appendix A**  
**Ethylene Oxide Commercial Sterilization Source Category**  
**SCV at Facilities where EtO Use is at least 40 tpy**

**Table A.1      Full List of Facilities with SCV, at Facilities where EtO Use is at least 40 tpy**

See filename "*EtO\_AppA.1\_SCV(40+)\_proposal.xlsx*"

**Table A.2      Final Run-by-Run Values for SCV, at Facilities where EtO Use is at least 40 tpy**

See filename "*EtO\_AppA.2\_SCV(40+)\_proposal.xlsx*"

**Table A.3      Test Data Not Included for SCV, at Facilities where EtO Use is at least 40 tpy**

See filename "*EtO\_AppA.3\_SCV(40+)\_proposal.xlsx*"

## **Appendix B**

### **Ethylene Oxide Commercial Sterilization Source Category**

#### **SCV at Facilities where EtO Use is at least 10 but less than 40 tpy**

##### **Table B.1 Full List of Facilities with SCV, at Facilities where EtO Use is at least 10 but less than 40 tpy**

See filename "*EtO\_AppB.1\_SCV(10-40)\_proposal.xlsx*"

##### **Table B.2 Final Run-by-Run Values for SCV, at Facilities where EtO Use is at least 10 but less than 40 tpy**

See filename "*EtO\_AppB.2\_SCV(10-40)\_proposal.xlsx*"

##### **Table B.3 Test Data Not Included for SCV, at Facilities where EtO Use is at least 10 but less than 40 tpy**

See filename "*EtO\_AppB.3\_SCV(10-40)\_proposal.xlsx*"

## **Appendix C**

### **Ethylene Oxide Commercial Sterilization Source Category SCV at Facilities where EtO Use is at least 1 but less than 10 tpy**

#### **Table C.1 Full List of Facilities with SCV, at Facilities where EtO Use is at least 1 but less than 10 tpy**

See filename "*EtO\_AppC.1\_SCV(1-10)\_proposal.xlsx*"

#### **Table C.2 Final Run-by-Run Values for SCV, at Facilities where EtO Use is at least 1 but less than 10 tpy**

See filename "*EtO\_AppC.2\_SCV(1-10)\_proposal.xlsx*"

#### **Table C.3 Test Data Not Included for SCV, at Facilities where EtO Use is at least 1 but less than 10 tpy**

See filename "*EtO\_AppC.3\_SCV(1-10)\_proposal.xlsx*"

## **Appendix D**

### **Ethylene Oxide Commercial Sterilization Source Category**

#### **SCV at Facilities where EtO Use is less than 1 tpy**

##### **Table D.1 Full List of Facilities with SCV, at Facilities where EtO Use is less than 1 tpy**

See filename *“EtO\_AppD.1\_SCV(less than 1)\_proposal.xlsx”*

##### **Table D.2 Final Run-by-Run Values for SCV, at Facilities where EtO Use is less than 1 tpy**

See filename *“EtO\_AppD.2\_SCV(less than 1)\_proposal.xlsx”*

##### **Table D.3 Test Data Not Included for SCV, at Facilities where EtO Use is less than 1 tpy**

See filename *“EtO\_AppD.3\_SCV(less than 1)\_proposal.xlsx”*